

CLEMSON UNIVERSITY

Turfgrass Program

(www.clemson.edu/turforamental/)

Tissue Testing for Turfgrasses

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The availability of the 13 essential plant nutrients accumulated from the soil is one of the most important factors affecting turfgrass health and quality. Although soil-testing methods are often used to predict nutrient needs and schedule fertilization, tissue testing is considered the best tool for assessing the success of a fertilizer program. This is especially true for nutrients that are not usually tested in soil (nitrogen and sulfur for example) or those for which soil tests are not particularly accurate (micronutrients in general).

Collecting and Handling a Tissue Sample

Pine needles, tree leaves, and other debris should be removed from the turf surface before collecting a tissue sample. If feasible allow at least 5-7 days to elapse between a topdressing, fertilization, or fungicide application and tissue sampling. Otherwise cleaning the sample is necessary (see instructions below). Clippings will typically be moist when collected. Air-drying is required to prevent rotting. Place in paper bags, not plastic, for shipping to the laboratory.

Take a representative sample from the turfgrass area of interest. Short-cut grasses are most easily collected in the basket of a mower. Tall grasses can be sampled by cutting the upper 1/3 of the leaf tissue with scissors. For general monitoring of the turf nutrient status, collect all the clippings from the area of interest, mix thoroughly and remove a one-pint subsample. For diagnosing turfgrass problems take two clippings samples – one from the area doing poorly and a second from a nearby area that appears normal. Comparison of tissue analysis from ‘bad’ and ‘good’ areas is quite helpful in assessing the role of nutrition in causing the turf problem. Obtaining a soil sample for nutrient and nematode analysis as well as a turf plug for disease diagnosis are also a good idea when diagnosing problems.

Tissue nutrients will fluctuate seasonally as well as being influenced by fertilizer and water management. If tissue samples are collected once or twice per year on a routine basis then samples should be taken at the same time of the year each year. A good time to sample warm-season turfgrasses is late May through early September and for cool season turfgrasses, April, July, and/or October.

Tissue Analysis Results

The relationship between tissue nutrient concentrations and plant health and vigor is not as well understood in turfgrasses as it is in crop plants. Therefore, there are not

sufficiency ranges for all grasses and the sufficiency range may be wide in some cases. However, plant analysis experts in the Southeast accept that research has established the sufficiency nutrient concentrations for bentgrass and bermudagrass greens listed in Table 1. Sufficiency ranges represent nutrient concentrations that are adequate for optimum plant growth and health. **Assuming the analysis of clean plant tissue**, nutrient concentrations below sufficiency indicate nutrient availability in the soil is lacking or roots are not accumulating enough of the nutrient (perhaps due to nematode, disease, or herbicide damage). Adding the nutrient, or repairing the root damage, will increase the nutrient concentration in the clippings and improve the health and vigor of the turfgrass. Values above the sufficiency range may indicate a wasteful use of fertilizer nutrients, a nutrient imbalance causing deficiency of another nutrient (excessive nitrogen (N) causing sulfur (S) deficiency for example), or toxicity (particularly for copper (Cu)).

Do not waste your time or money analyzing clippings samples that are contaminated with sand, soil, or fertilizer and fungicide residues. The results from these samples can be misleading because the nutrient levels will reflect the amount of sand in the sample or the nutrient levels of the soil, fertilizer, or fungicide, not the tissue. When contaminated with sand or soil the concentration of several nutrients (usually (N), phosphorus (P), and potassium (K)) will measure lower than what is actually in the tissue. For other nutrients (micronutrients and calcium (Ca) in particular) the analysis of contaminated tissue will result in higher concentrations than what is actually in the tissue. Cleaning clippings before analysis is absolutely necessary in situations where sand, soil, or fertilizer and fungicide residues contaminate the sample.

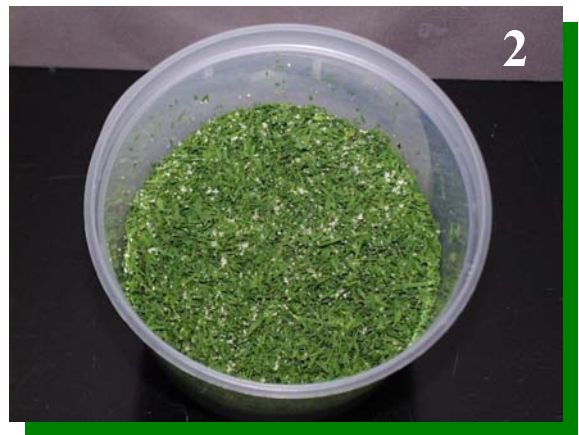
Table 1. Sufficiency concentrations for bentgrass and bermudagrass greens in the Southeast (<http://www.agr.state.nc.us/agronomi/saesd/s394.htm>).

Nutrient	Bentgrass	Bermudagrass
Nitrogen (N), %	4.0 – 5.0	3.0 – 4.0
Phosphorus (P), %	0.3 - 0.6	0.2 – 0.4
Potassium (K), %	2.2 – 3.5	1.8 - 2.25
Calcium (Ca), %	0.25 – 0.75	0.25 - 0.50
Magnesium (Mg), %	0.2 – 0.4	0.15 – 0.30
Sulfur (S), %	0.2 – 1.0	0.15 – 0.65
Zinc (Zn), mg/kg	20 – 70	15 – 70
Copper (Cu), mg/kg	5 – 15	5 – 20
Manganese (Mn), mg/kg	25 – 300	20 – 300
Iron (Fe), mg/kg	50 – 300	50 – 250
Boron (B), mg/kg	3 - 20	5 - 60

Cleaning Grass Clippings for Tissue Analysis



Supplies needed to remove sand from clippings – cold distilled water, a plastic container, fine-mesh strainer, detergent (if fertilizer or pesticide residues are a concern), plastic spoon, and paper towels.



Grass clippings mixed with sand.

Place dirty clippings in cold water and stir with plastic spoon for no more than 30 seconds to separate sand and clippings.



Clippings float while sand falls to bottom.



Scoop or pour off clean clippings using strainer. Be careful not to get sand back into clippings.

To prevent rotting, blot clippings with paper towels to remove excess water. Then spread clippings on paper towels to air-dry before shipping.

